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ABSTRACT

On the premise that individualized instruction and its many variations has become increasingly more important to the vocational and technical educator, various aspects of an individualized instructional program are discussed under eight headings: (1) What Is Meant by Individualizing Instruction in Vocational and Technical Education? (2) Why Do We Need Individualized Instruction in Vocational and Technical Education? (3) How Are Individualized Instructional Systems Developed for Vocational and Technical Education? (Eight points to be considered in developing individualized programs are discussed.) (4) Where Is Individualized Instruction for Vocational and Technical Education Implemented in Michigan? (Five instructional programs are described.) (5) What Impact Could Individualized Instruction Have on Vocational and Technical Education in Michigan? (6) What Are Some Problems Involved with Implementing Individualized Instructional Systems? (7) Resources to Consult for Further Information About Individualized Instruction for Vocational and Technical Education, and (8) What Are Some Selected References for Individualized Instruction in Vocational and Technical Education? (WL)

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TITLE: INDIVIDUALIZING INSTRUCTION IN VOCATIONAL AND TECHNICAL EDUCATION

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There has been a growing concern expressed among many educators over the apparent inability of the school to apply newly developed educational technology. Vocational and technical educators, likewise, are confronted with new terms, methods, materials, equipment and techniques that cannot be ignored. As examples: performance objectives, systems development techniques, new methods of curriculum evaluation, curricular organization based on hierarchies and clusters of selected skills and knowledge, and competency based education have received significant attention from teachers, administrators, boards of education, and state departments of education. In a similar manner, the idea of individualized instruction and its many variations has become increasingly more important to the vocational and technical educator.

WHAT IS MEANT BY INDIVIDUALIZING INSTRUCTION IN VOCATIONAL AND TECHNICAL EDUCATION?

It has already been suggested that there are many variations of this instructional method. Burns (1971, 55) indicates that there is a simple definition, but in practice, there are degrees of individualization which do not take into account all the features of the ideal. "*Ideally, individualized instruction is a system which tailor-makes learning in terms of learner needs and characteristics.*" This is to say, individualized instruction in vocational and technical education concerns itself mainly with three variables consisting of: (1) career goals and training objectives of the vocational and technical student; (2) student learning styles and preferences; and (3) the time required by the student for mastery of necessary skills and knowledge.

In relation to these variables, individualized instruction must be based on the individual learner's needs, skills, and motives. It should be emphasized that individualization is based on the *how* a student learns and not so much on the *what* is learned. The student demonstrated skills and knowledge are the same as those expected to result from the traditional teaching methods.

In order for the learner to achieve the necessary skills through individualization, certain instructional features must be present. Features to be included are: (1) learner diagnosis that take into account present skills and knowledge; (2) a variety of curricular units (modules, lessons, etc.) are to be offered; (3) a variety of teaching materials and aids which take into account

the learner's strengths and weaknesses in terms of reading level and rate; preference for visual, auditory, or tactile learning; and other specific skills, or lack of them, must be provided; and (4) flexible time variables have to be used because some learners proceed slowly and others rapidly for a variety of reasons such as: intelligence, study habits, prior learning, motivation, competitive pressure, social/family pressure, and physical/physiological condition.

Synthesizing these features into an effective individualized instruction system takes considerable insight, effort, and co-operation. Ullery (1971, 22) lists a number of characteristics of a modern individualized instructional system which should typify vocational and technical education where each student: (1) enters a chosen job family program at a level corresponding to his previous experience and knowledge; (2) is guided to learning experiences consistent with goals mutually agreed upon; (3) learns at a rate based on one's own ability by using self-instructional materials and techniques; (4) has greater flexibility in allowing for a change of program with fewer penalties; and (5) experiences success in learning--there are no failures. Some students simply take longer than others to accomplish goals.

Pucel and Knaak (1975, 13-19) summarize a definition of individualized instruction suitable for use in vocational and technical education as "*a global term used to designate any instructional methodology or strategy which attempts to make a program responsive to the unique needs of individuals.*" These educators have suggested several models or approaches for grouping individualized instruction according to the major instructional variables of content, time, and proficiency levels:

(1) Fixed-content, fixed-time, fixed-proficiency (model is not feasible);
(2) Fixed-content, fixed-time, variable-proficiency (traditional model);
(3) Fixed-content, variable-time, fixed-proficiency (model recommended for vocational education);
(4) Fixed-content, variable-time, variable-proficiency;
(5) Variable-content, fixed-time, fixed-proficiency;
(6) Variable-content, fixed-time, variable-proficiency;
(7) Variable-content, variable-time, fixed-proficiency; and
(8) Variable-content, variable-time, variable-proficiency.

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(6) Variable-content, fixed-time, variable-proficiency;
(7) Variable-content, variable-time, fixed-proficiency; and
(8) Variable-content, variable-time, variable-proficiency.

The model of fixed-content, variable-time, fixed-proficiency is the most commonly used in vocational and technical education. The goal of the vocational and technical education model is to help students desiring occupational entry gain the skills and knowledge required, regardless of the amount of time it takes for each individual to master the tasks. Students entering an individualized instructional program should do so with the expectation that they eventually will be competent to perform entry level jobs in their selected occupation.

In addition to these three major instructional variables, a component of variable delivery in terms of different modes of instruction must be considered. The vocational and technical educator should be aware of not only the logical but also the psychological appropriateness of a given method of instruction. A given student may need to utilize an entirely different learning approach than another student even though their skill and knowledge goals and objectives are identical.

WHY DO WE NEED INDIVIDUALIZED INSTRUCTION IN VOCATIONAL AND TECHNICAL EDUCATION?

There are several advantages that suggest the need for and use of individualized instruction. Most significantly, it can help maximize student learning. Despite learning disabilities, the individual can complete a course or program. Individualized instruction lets students learn at their own pace, so it does not hold back fast learners and does not penalize slow learners.

Educators often cannot adequately deal with heterogeneous classes of students. This often occurs because of the goals, objectives, learner styles, preferences and time required for mastery. Many students are often penalized by a lack of positive reinforcement and active involvement with vocational and technical subject matter. For example Deterline (1962, 74) contends that *"students at the extreme upper and lower ends of the continuum of learning aptitude are usually penalized because of the difference between the pace set by the teacher for the class and the rate of subject matter consideration that would be best for each individual student."*

The desirability of using individualized instruction has also been emphasized by Burns (1971, 55), for *"No two living organisms are alike."* Based on this assumption, Burns states individualized instruction is essential because no two learners:

(1) achieve at the same rate,
(2) achieve using the same study techniques,
(3) solve problems in exactly the same way,
(4) possess the same repertoire of behaviors,
(5) possess the same pattern of interests,
(6) are motivated to achieve to the same degree,
(7) are motivated to achieve the same goals,
(8) are ready to learn at the same time, and
(9) have exactly the same capacity to learn.

HOW ARE INDIVIDUALIZED INSTRUCTIONAL SYSTEMS DEVELOPED FOR VOCATIONAL AND TECHNICAL EDUCATION?

The alternatives for developing individualized instructional systems are as numerous as the approaches that may be developed. For example, guidelines used to identify program content, to discover strengths and weaknesses, and to determine the effectiveness and efficiency of individualized instructional systems proved to be good starting point. Most systems provide variation of one or more elements, and the instructional approach and technology can differ for each. As a basis for vocational and technical educators, individualized instructional approaches can be developed by considering the following points:

- Conduct a needs assessment.
  The needs assessment should answer two questions: (1) Is there a need for the program in terms of net new employee demand? and (2) Are students interested in pursuing such an educational program? Data available from manpower and employment security projections and specifically the needs within a Standard Metropolitan Statistical Area (SMSA) should be reviewed as a first step. A locally directed general manpower/educational needs survey plus specific occupational needs surveys should give additional insight as to whether a program should be developed. Advisory committees should be directly involved in the identification and review of all data pertinent to program development.

Students at various educational levels should be requested to indicate their career plans as well as their educational objectives. Secondary and post-secondary students and adults should be asked what their future plans are. In-school and community surveys should be conducted in order to gain a more accurate estimate of potential program requests.

- Conduct a feasibility study.

  The feasibility study will provide answers which will determine whether or not to develop a program. Those conducting the feasibility study need to ask the following questions: (1) Is it really practical to develop the program? (2) Do we have the human and physical resources and finances? (3) What methods will meet the needs of the population and what percentage of the population will be served? and (4) What finances and resources are available for the various instructional methods? The feasibility study should include an analysis of instructional delivery options, and then determine the costs for each option.

- Complete an occupational job/task analysis.

  This activity provides a systematic method of acquiring knowledge about occupations, the jobs that constitute an occupation, and the tasks and sub-tasks which make up the jobs. Specific work activities, related job knowledge, required skills, work environments, tools and equipment, and accepted standards of success are identified via the occupational job/task analysis. The analysis helps validate what is to be taught and what one needs to know for the selected occupation. Advisory committees are to be directly involved in this activity.

- Develop performance objectives and criteria for determining student success.

  Performance objectives must be based on an adequate occupational job/task analysis. The content of the performance objectives is based upon the necessary skills and knowledge required to function successfully in a given occupation. The content of the total instructional system and evaluation strategies are drawn directly from the performance objectives.

  Criteria for evaluation of student success are statements of learner behavior to be observed. This observation can include more than paper and pencil tests, but also should permit interviews, student demonstration of skills, and employer or supervisor evaluations.

- Develop a method for assessing students' prerequisite skills and knowledge.

  At the time the desired performance objectives are being specified, consideration should be given to developing an adequate understanding of learner skills, knowledge, and learning style preferences. The understanding should cover more than just the general psychological and intellectual characteristics of the learners. The student learning styles and preferences must receive careful consideration in developing various instructional strategies. Pretesting should yield more effective individualized instructional systems.

- Develop and verify performance tests and knowledge assessment instruments.

  There has to be appropriate performance tests and knowledge assessment for each performance objective. The development of partial tests for system validation and debugging purposes is required in addition to the final performance tests. All the technology and caution of test construction is required in developing a valid individualized instructional system. The developer must consider factors such as: content validity, reliability, objectivity, discrimination, comprehensiveness, and ease of administration and scoring.

- Identify and/or develop instructional materials and the delivery system.

  Careful consideration should be given to various commercially prepared instructional materials and the large selection of educator prepared materials found through the Educational Resources Information Center and in the Abstracts of Instructional Materials in Vocational and Technical Education (ERIC/AIM). Major design considerations to be used in developing individualized instructional materials as suggested in the literature include: self-pacing by the learner, immediate reinforcement in each unit (module, lesson, etc.), minimal number of student errors in each unit, limited unit size for maximum effectiveness without the loss of efficiency, observable overt responses for analysis and evaluation, constructed response versus selecting the best solution, progression of the instructional sequence from simple to complex, and the use of constant prompting and review.

  With respect to the above considerations, the materials must be arranged so that the learner be confronted with problems and

situations designed not to be so difficult as to be perplexing or so simple as to be boring. It is important for the student to perceive the reinforcement relationship within each unit by the confirmation of correct response and to also assure him that he is making progress toward program and course objectives. Regardless of the pace set by each learner, every learner will be expected to be able to perform the behaviors by the completion of the individualized instruction units.

WHERE IS INDIVIDUALIZED INSTRUCTION FOR VOCATIONAL AND TECHNICAL EDUCATION IMPLEMENTED IN MICHIGAN?

The following descriptions of selected individualized instructional approaches are provided in order to give an impression of some of the types of systems presently used or being implemented in Michigan. These systems deal totally or in part with vocational and technical education. Individual instructors are successfully utilizing variations of individualized instruction in a number of classrooms throughout the state.

1. PERSONALIZING EDUCATIONAL PROGRAMS (PEP) UTILIZING COGNITIVE MAPPING

Contact: President
Oakland Community College
2480 Opdyke Road
Bloomfield Hills, Michigan 48013

This approach to individualizing instruction consists of seven major components which are integrated into a total educational delivery system. Hill and Nunney (1971, 3) describe these components as:

- Diagnostic Testing and Cognitive Mapping
  The college first finds out how the students use symbols to solve problems - how the students use their senses and inference processes when faced with a situation which has no existing meaning for them. How they search for meaning in their environment. Whether the student prefers: to listen or read; to see things only as they affect him or as his family or associates would see them; to categorize or to contrast or relate information. These diagnostic test data are used to produce a cognitive map for each student.

- Develop a Personal Education Prescription
  Next the college develops a personal education prescription for the student designed to guarantee success in the course.

- Classroom Presentation of Concepts and "Burst" to Prescription Centers
  After an initial lecture-discussion meeting with a faculty member, the student "Bursts" out of the classroom setting to study in one or more of the prescription centers, such as the Individualized Programmed Learning Lab (IPLL), Carrel Arcades, Learning Resource Center, or Seminar. The student can also study on an individual basis.

- Unitized Courses and Monitoring Achievement Through Testing
  By using a unitized approach to course work and unit tests, the college is able to assess whether a student has mastered the content of the unit before he moves on to the next unit. Constant feedback to the student and teacher from the prescription centers leads to modification of the personal prescription.

- Modify Prescription to Guarantee Success
  The overall aim is to guarantee the student a 90 percent success level of performance.

2. A PROJECT FOR ALTERNATIVE LEARNING MEDIA (PALM) SELECTED VOCATIONAL EDUCATION PROGRAMS

   Contact: Director
   Vocational and Career Development Education
   St. Clair County Skill Center
   St. Clair County Intermediate School District
   1111 Delaware Avenue
   Marysville, Michigan 48040

The primary project goal is to identify and apply a process of correlating learning styles of students with alternative instructional techniques in order to maximize student learning.

The students entering a selected occupational program will take a diagnostic test which will aid in the development of an individualized learning-style map. From the learning-style map the student's learning prescription is developed. For example, the map might show the student learns best by hearing words and associating with people. According to the learning prescription the student would use audio visual media, participate in small group discussion and/or use student to student situations for optimizing learning.

Operational procedures for project activities include:

- Prepare a flow chart and schedule of proposed activities;
- Employ staff required to complete described activities;
- Study Oakland Community College's personalized educational program;
- Identify step-by-step developmental process;
- Select training program for demonstration;
- Implement step-by-step developmental process with an occupational program;
- Identify with assistance of technical specialists the appropriate teaching techniques and media;
- Identify the process of correlating alternative learning techniques and styles;
- Prepare media packages by conducting market search, acquiring prepared materials, developing materials, and assembling materials;
- Organize learning packages;
- Conduct evaluation of product and processes;
- Prepare summary and describe process; and
- Prepare plan for implementing model.

3. PERSONALIZED SYSTEM OF INSTRUCTION (PSI) APPROACH TO VOCATIONAL EDUCATION

Contact: Chairman
Department of Industrial Education
and Technology
Central Michigan University
Mt. Pleasant, Michigan 48859

Personalized System of Instruction (PSI) is an instructional system, an alternative to the usual lecture-demonstration-recitation method of teaching, which permits an instructor to give personal instruction to as many as one hundred students at a time (Nee, 1976, Sherman, 1974). In most cases, it achieves greater teaching efficiency without increasing the cost of instruction.

The principal feature of PSI is that each student works independently from carefully written study guides which state specific objectives and suggest a procedure for accomplishing them. These may include reading in conventional textbooks, working problems, using computers, programmed instruction, viewing films, or doing experiments.

The five "distinguishing features" of PSI and their rationales are linked together logically by deriving each from the mastery learning approach:

- Learners are to master the material (the unit-perfection requirement so individual students stay with a topic until it is mastered).
- Slow students are permitted to take longer than fast students. This is self-pacing.
- If students are moving at different paces, lectures cannot be used to dispense critical information, since that would set a pace. Lectures and demonstrations are to be used as vehicles of motivation rather than as sources of critical information.
- If lectures are not used, they must be replaced with something, such as written study guides or other carefully prepared instructional materials.
- With a number of units and a test on each one, a corps of in-class peer group tutors is needed. The use of tutors permits repeated testing, immediate evaluation and a marked enhancement of the personal-social aspect of the educational process.

The three essential parts of a PSI unit are the *objectives*, the *procedures* (both in a study guide) and the *test*. PSI, just as with any effective teaching method, requires that the performance objectives, the instructional procedure and the criterion tests must be consistent and the procedures must be adequate to accomplish the objectives.

4. AGRICULTURE AND NATURAL RESOURCES EDUCATION INSTITUTE COMPETENCY BASED EDUCATION RESEARCH PROJECT

Contact: Project Director
College of Agriculture
and Natural Resources
Education Institute
Agriculture Hall
Michigan State University
East Lansing, MI 48824

This instructional strategy is intended to improve the quality of instruction in Michigan vocational agricultural programs. Major components of this strategy include a module concept and student terminal performance objectives.

- Module Concept
  The module concept is a synopsis of the module material and what the student will be studying. It depicts the relevance of the subject material and has explanations of why the student should study the material. The module concept explains how the module is related to the student's occupational program.

- Student Terminal Performance Objectives
  Student terminal performance objectives are descriptions of intended outcomes which require the acquisition of certain knowledges and skills. The conditions, performance, and criteria is established for each student performance objective. The instructional strategy contains the following elements:

- Titles and subtitles of instructional areas define the relevant content that should be covered by the instructor.
- Examples of supporting references are included in the modules to assist the instructor in accomplishing the desired performance of the student.
- Examples of student learning activities are written so that the student may become actively involved in various activities that assist the student in achieving the performance objectives.
- Suggested evaluation techniques are provided to assist the instructor in determining how well the student can perform the student performance objective under specified conditions.
- Instructional materials and/or equipment which are specific to the modules and essential to enhance the learning of students are listed.

5. INDIVIDUALIZED INSTRUCTION COMPUTERIZED MANAGEMENT SYSTEM

Contact: Director
Capital Area Career Center
611 Hagadorn Road
Mason, Michigan 48854

The Capital Area Career Center has been operating an individualized, modularized, performanced based, computer managed instruction program since 1972. Training is offered to secondary students in some sixty occupations. Students select an occupational goal through a process of career awareness, exploration, decision making, and finally a needs assessment. The result is a learning prescription listing all skills that must be mastered by the student in order to be certified for a desired occupational goal. The curriculum allows the students to move at their own rate and their progress to be measured by comparing individual student performance with specific objectives rather than other students.

Major curriculum implementation activities engaged in consist of:

- A feasibility study to determine which occupations were to be selected for inclusion in the vocational education Career Center;
- Job/task analyses were developed to determine what a person needed to know and do in order to perform each occupation properly;
- Performance objectives were developed based on the job/task analysis;
- A module of instruction was written for each task.
- Via the computer, each student is provided with an individualized listing of all the modules needed to complete the career program called a learning prescription.
- Each student receives a weekly schedule telling what modules to work on for that week;
- The computer provides instructors with daily class lists at the beginning of each week, indicating which student they will have and which modules they are supposed to complete.

Upon the completion of the student's goal(s), a graduation or achievement report listing all mastered skills is provided the student and potential employers. This is used in place of a letter grade.

WHAT IMPACT COULD INDIVIDUALIZED INSTRUCTION HAVE ON VOCATIONAL AND TECHNICAL EDUCATION IN MICHIGAN?

Individualized instruction can help vocational and technical educators in Michigan respond to expectations and demands being made by all segments of Michigan's society. The people of Michigan expect greater access to vocational and technical education. This is true of the affluent as well as the poor, the disadvantaged, and the handicapped. Individualized instructional systems, by their very nature, can be designed for a wide range of learner needs.

Greater instructional accountability is a major goal of Michigan's Vocational and Technical Education Service. Accountability is a concern within the State and the need for increased accountability will only increase in the years to come. The people of Michigan are concerned that the vocational and technical education provided is effective and efficient, and the cost of delivering the instruction is totally reasonable in respect to the benefits derived. Individualized instructional systems can help in making vocational and technical education more effective and efficient.

Individualized instruction will permit greater flexibility for scheduling learner entry and exit from vocational and technical instruction. There can be entry and exit without penalty. Individualized instruction can change the emphasis on a constant time standard for instruction to one of an emphasis on constant performance standards. Educators will be concerned with competency and not normative grading. It is to be noted that competency based education and self-instructional approaches can be major features of individualized instructional systems.

Individualized instruction is the logical extension of the efforts and accomplishments already made in Michigan in the areas of competency based education and performance objectives.

WHAT ARE SOME PROBLEMS INVOLVED WITH IMPLEMENTING INDIVIDUALIZED INSTRUCTIONAL SYSTEMS?

Improper attempts in implementing individualized instruction can cause problems, some of which can become quite serious. Caution should be observed in respect to a number of potential problem areas. Some of the major concerns of educators, boards of education, parents, and students consist of:

(1) The grading system is often altered with the elimination of traditional grading, and instead various lists of competencies or tasks successfully performed by the students are often used as records of success. Transfer of credit often becomes a problem because some schools will not recognize the listing of competencies but insist on a course title with a traditional grade appearing on a student's transcript. Variations of individualized instructional systems do permit the use of traditional grading systems, but educators, parents, and students should be aware of this problem.

(2) Finding teachers qualified to develop materials and to function as a part of an individualized instructional system is difficult. Presently, there are few teacher training institutions providing for curriculum development activities directly relating to the detailed organization, planning, and implementation of individualized instructional systems. Teachers cannot be expected to implement an approach for which they are ill prepared to later supervise. When teachers have been told to implement within a time period of 12, 18, or even 24 months without an adequate orientation then total confusion, anxiety, and failure usually result. Teachers must understand and be committed to the individualized instruction approach before implementation.

(3) The in-service training of teachers in individualized instructional approaches can have the same problems any in-service program encounters. Teachers should have the opportunity to analyze, plan, develop, and debug individualized instructional materials and systems under the supervision and leadership of individuals proven successful at implementation in an operational setting. Time must be made available to the teachers for adequate orientation and preparation. It must be done well in advance of the term that the actual implementation is scheduled. Costs for in-service training and development time can be costly depending on how much and how fast the teachers are expected to be involved.

(4) If the total program offering of a school is to be individualized, then it is obvious that the school must be run differently. Moving students to educational centers as well as moving students within a center can at first cause disorganization and confusion. Bussing problems as well as student entry to courses or units at varying times during the year and sometimes on a weekly basis have to be worked out well in advance of implementation. Some of the more successful approaches have required a major dependency on

electronic data processing systems in an attempt to coordinate student movement. Teachers are often put in a position where they do not have a set class for a given term, but instead will have many different classes which are changing on a weekly or even daily basis. Teachers sometimes feel very uncomfortable with such a situation.

The previous concerns or problems have been identified with the total committment to individualization at a given educational center. Individualization by a single instructor can often meet with similar problems. Often (and rightfully so) students will complete the requirements as specified by the performance objectives earlier or later than what a traditional school calendar specifies. The teacher is often troubled because enrichment experiences are provided some students while others have not met all of the requirements stated in every performance objective. The learners have indeed mastered at some constant prescribed criterion for certain well defined performance. They may not have, though, received a grade of A, C, or F in Automotive Mechanics II or Bookkeeping I.

(5) Costs for implementation of various individualized approaches run from much more expensive, about the same, to considerably less depending on the scope of the individualization and period of time that a given system is to be used. Major expenditures for equipment, in-service training and development time can be justified only after a thorough study and analysis determines that individualization can truly be better in terms of its educational worth and in terms of what the available and projected resources will permit. Individualization by a single instructor for a given class or program can actually be less expensive over a given period of time if measured in terms of the educational effectiveness achieved when compared to a traditional approach to teaching.

RESOURCES TO CONSULT FOR FURTHER INFORMATION ABOUT INDIVIDUALIZED INSTRUCTION FOR VOCATIONAL AND TECHNICAL EDUCATION.

The following secondary schools, community colleges, technical institutes, universities, and firms have information and materials that could be used in developing individualized instructional systems.

Director
David Rankin Technical Institute
St. Louis, Missouri 63100

Director
Fox Valley Technical Institute
Appleton, Wisconsin 54911

Director
Scott Community College
Career Division
601 West 2nd Street
Davenport, Iowa 52801

Director
Special Intermediate School District 916
for Vocational-Technical Education
2233 North Hamline Avenue
Roseville, Minnesota 55113

Center for Personalized Instruction
Georgetown University
Washington, D.C. 20057

Westinghouse Learning Press
2680 Hanover Street
Palo Alto, California 94304

EDUTEK, Inc.
1340 Air Park West
Lincoln, Nebraska 68524

Systems Development Corporation
2500 Colorado Avenue
Santa Monica, California 90406

Media Systems Corporation
250 West Main Street
Moorestown, New Jersey 08057

PAMI Learning Systems, Inc.
Box 163
Collinsville, Illinois 62234

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